

Contents

Introduction	xiii
Chapter 1 ArcObjects	1
1.1 Geodatabase	2
1.1.1 Vector Data.....	2
1.1.2 Raster Data.....	3
1.1.3 Triangulated Irregular Networks (TINs).....	3
1.1.4 Location Data.....	4
1.1.5 Nongeographic Data	4
1.2 ArcObjects.....	4
1.2.1 Objects and Classes	4
1.2.2 Relationships between Classes	5
1.2.3 Interfaces	6
1.2.4 Properties and Methods	7
1.3 Organization of ArcObjects	9
1.4 Help Sources on ArcObjects.....	10
1.4.1 ArcObjects Developer Help.....	10
1.4.2 Environmental Systems Research Institute, Inc. (ESRI) Object Browser.....	10
1.4.3 ESRI Library Locator	12
1.5 Geoprocessing Object	12
References Cited.....	13
Chapter 2 Programming Basics.....	15
2.1 Basic Elements.....	16
2.1.1 Projects, Modules, Procedures, and Macros	16
2.1.2 Variables.....	17
2.1.3 Use of Properties and Methods	18
2.1.4 QueryInterface.....	19
2.1.5 Comment Lines and Line Continuation	20
2.1.6 Arrays.....	20
2.1.7 Collections.....	21
2.2 Writing Code.....	21
2.2.1 <i>If...Then...Else</i> Statement.....	21
2.2.2 <i>Select Case</i> Statement.....	22

2.2.3	<i>Do...Loop</i> Statement	23
2.2.4	<i>For...Next</i> Statement	24
2.2.5	<i>For Each...Next</i> Statement	25
2.2.6	<i>With</i> Statement	25
2.2.7	Dialog Boxes	26
2.3	Calling Subs and Functions	27
2.4	Visual Basic Editor	28
2.5	Debugging Code	30
2.5.1	Type of Error	30
2.5.2	<i>On Error</i> Statement	31
2.5.3	Use of Breakpoint and Immediate Window	32
Chapter 3	Customization of the User Interface	35
3.1	Creating a Toolbar with Existing ArcMap Commands	36
3.2	Adding a New Button	37
3.3	Adding a New Tool	39
3.4	Storing a New Toolbar in a Template	42
3.5	Adding a Form	43
3.5.1	Designing a Form	44
3.5.2	Associating Controls with Procedures	45
3.5.3	Running a Form	47
3.5.4	Linking a Button to a Form	48
3.6	Storing a Form in a Template	48
Chapter 4	Dataset and Layer Management	51
4.1	Using Datasets in ArcGIS	52
4.2	ArcObjects for Datasets and Layers	52
4.3	Adding Datasets as Layers	54
4.3.1	<i>AddFeatureClass</i>	54
4.3.2	<i>AddFeatureClasses</i>	56
4.3.3	<i>AddRaster</i>	58
4.3.4	<i>AddLayerFile</i>	59
4.3.5	<i>AddTable</i>	60
4.4	Managing Layers	61
4.4.1	<i>FindLayer</i>	61
4.5	Managing Datasets	62
4.5.1	<i>CopyDataset</i>	62
	Box 4.1 <i>CopyDataset_GP</i>	63
4.5.2	<i>DeleteDataset</i>	64
4.6	Reporting Geographic Dataset Information	65
4.6.1	<i>SpatialRef</i>	65
Chapter 5	Attribute Data Management	67
5.1	Managing Attribute Data in ArcGIS	68
5.2	ArcObjects for Attribute Data Management	68

5.2.1	Tables.....	68
5.2.2	Fields and Field.....	69
5.2.3	Relationship Classes	70
5.3	Listing Fields and Field Properties.....	73
5.3.1	<i>ListOfFields</i>	73
5.3.2	<i>ListFieldProps</i>	74
5.3.3	<i>UseFindLayer</i>	76
5.4	Adding or Deleting Fields	77
5.4.1	<i>AddDeleteField</i>	77
	Box 5.1 <i>AddDeleteField_GP</i>	79
5.5	Calculating Field Values	79
5.5.1	<i>CalculateField</i>	79
	Box 5.2 <i>CalculateField_GP</i>	80
5.5.2	<i>UpdateValue</i>	81
5.6	Joining and Relating Tables.....	82
5.6.1	<i>JoinTableToLayer</i>	82
5.6.2	<i>JoinMultipleTables</i>	84
5.6.3	<i>RelateTableToLayer</i>	86
	Box 5.3 <i>RelateTableToLayer_GP</i>	87
5.6.4	<i>RelationalDatabase</i>	88
Chapter 6	Data Conversion	91
6.1	Converting Data in ArcGIS	92
6.2	ArcObjects for Data Conversion.....	92
6.2.1	Objects for Feature Data Conversion	92
6.2.2	Objects for Rasterization and Vectorization	93
6.2.3	Objects for XY Event	95
6.3	Converting Shapefile to GeoDatabase	96
6.3.1	<i>ShapefileToAccess</i>	96
	Box 6.1 <i>ShapefileToAccess_GP</i>	98
6.3.2	<i>MultipleShapefilesToAccess</i>	98
6.3.3	<i>ShapefilesToFeatureDataset</i>	100
	Box 6.2 <i>ShapefilesToFeatureDataset_GP</i>	102
6.4	Converting Coverage to GeoDatabase and Shapefile.....	103
6.4.1	<i>CoverageToAccess</i>	103
6.4.2	<i>CoverageToShapefile</i>	104
6.5	Performing Rasterization and Vectorization	106
6.5.1	<i>FeatureToRaster</i>	106
	Box 6.3 <i>FeatureToRaster_GP</i>	108
6.5.2	<i>FCDescriptorToRaster</i>	108
6.5.3	<i>RasterToShapefile</i>	110
6.5.4	<i>RasterDescriptorToShapefile</i>	111
6.6	Adding XY Events.....	113
6.6.1	<i>XYEvents</i>	113
	Box 6.4 <i>XYEvents_GP</i>	115

Chapter 7	Coordinate Systems	117
7.1	Managing Coordinate Systems in ArcGIS	118
7.1.1	Defining Coordinate Systems	118
7.1.2	Performing Geographic Transformations	118
7.1.3	Projecting Datasets.....	119
7.2	ArcObjects for Coordinate Systems	119
7.3	Manipulating On-the-Fly Projection.....	122
7.3.1	<i>UTM_OnTheFly</i>	122
7.3.2	<i>IDTM_OnTheFly</i>	122
7.4	Defining Coordinate Systems	124
7.4.1	<i>DefineGCS</i>	125
	Box 7.1 <i>DefineGCS_GP</i>	126
7.4.2	<i>CopySpatialReference</i>	127
7.5	Performing Geographic Transformations	128
7.5.1	<i>NAD27to83_Map</i>	128
7.5.2	<i>NAD27to83_Shapefile</i>	129
7.6	Projecting Datasets.....	134
7.6.1	<i>ProjectShapefile</i>	134
	Box 7.2 <i>ProjectShapefile_GP</i>	137
7.6.2	Use of a Different Datum.....	137
7.6.3	<i>ReprojectShapefile</i>	137
	Box 7.3 <i>ReprojectShapefile_GP</i>	141
Chapter 8	Data Display	143
8.1	Displaying Data in ArcGIS.....	144
8.1.1	Displaying Vector Data	144
8.1.2	Displaying Raster Data	144
8.1.3	Use of Color Ramp and Classification Tools	144
8.1.4	Designing a Layout.....	144
8.2	ArcObjects for Data Display	145
8.2.1	Renderer Objects.....	145
8.2.2	Classification Objects.....	146
8.2.3	Color Ramp and Color Objects	147
8.2.4	Layout Objects	148
8.3	Displaying Vector Data	149
8.3.1	<i>GraduatedColors</i>	149
8.3.2	<i>GraduatedSymbols</i>	155
8.3.3	<i>UniqueSymbols</i>	157
8.4	Displaying Raster Data	158
8.4.1	<i>RasterUniqueSymbols</i>	158
8.4.2	<i>RasterClassifyColorRamp</i>	161
8.4.3	<i>RasterUserDefinedColorRamp</i>	164
8.5	Making a Page Layout.....	166
8.5.1	<i>Layout</i>	166

Chapter 9	Data Exploration.....	175
9.1	Exploring Data in ArcGIS	176
9.2	ArcObjects for Data Exploration.....	176
9.2.1	Use of a Query Filter	177
9.2.2	Cursor	178
9.2.3	Data Statistics.....	179
9.3	Performing Attribute Query	180
9.3.1	<i>SelectFeatures</i>	180
	Box 9.1 <i>SelectFeatures_GP</i>	181
9.3.2	<i>SelectRecords</i>	181
9.4	Performing Spatial Query	184
9.4.1	<i>SpatialQuery</i>	184
	Box 9.2 <i>SpatialQueryByName_GP</i>	185
9.4.2	<i>SpatialQueryByName</i>	186
9.4.3	<i>MultipleSpatialQueries</i>	187
9.4.4	<i>SelectByShape</i>	189
9.5	Combining Spatial and Attribute Queries	192
9.5.1	<i>BufferSelect</i>	192
9.5.2	<i>IntersectSelect</i>	195
9.6	Deriving Descriptive Statistics.....	196
9.6.1	<i>DataStatistics</i>	197
	Box 9.3 <i>DataStatistics_GP</i>	198
9.6.2	<i>DataSubsetStatistics</i>	198
Chapter 10	Vector Data Operations.....	201
10.1	Analyzing Vector Data in ArcGIS	202
10.2	ArcObjects for Vector Data Analysis	202
10.3	Buffering	204
10.3.1	<i>Buffer</i>	204
	Box 10.1 <i>Buffer_GP</i>	206
10.3.2	Buffer Options.....	206
10.4	Performing Overlay.....	207
10.4.1	<i>Intersect</i>	207
	Box 10.2 <i>Intersect_GP</i>	209
10.4.2	Updating Area and Perimeter of a Shapefile.....	209
10.5	Joining Data By Location.....	211
10.5.1	<i>JoinByLocation</i>	211
10.6	Manipulating Features	213
10.6.1	<i>Dissolve</i>	213
	Box 10.3 <i>Dissolve_GP</i>	214
10.6.2	<i>Merge</i>	215
10.6.3	<i>Centroid</i>	216

Chapter 11	Raster Data Operations	221
11.1	Analyzing Raster Data in ArcGIS	222
11.2	ArcObjects for Raster Data Analysis	223
11.2.1	Raster Objects	223
11.2.2	Operator Objects	223
11.3	Managing Raster Data	226
11.3.1	<i>MakePermanent</i>	226
11.3.2	<i>ExtractByMask</i>	228
Box 11.1	ExtractByMask_GP.....	229
11.3.3	<i>RasterQuery</i>	230
11.3.4	<i>Query2Rasters</i>	231
11.4	Performing Local Operations.....	233
11.4.1	<i>ReclassNumberField</i>	233
Box 11.2	ReclassNumberField_GP	235
11.4.2	<i>Combine2Rasters</i>	235
Box 11.3	Combine2Rasters_GP	237
11.4.3	Other Local Operations.....	237
11.5	Performing Neighborhood Operations.....	237
11.5.1	<i>FocalMean</i>	238
Box 11.4	FocalMean_GP.....	239
11.6	Performing Zonal Operations	239
11.6.1	<i>ZonalMean</i>	239
Box 11.5	ZonalMean_GP	241
11.7	Performing Distance Measure Operations.....	241
11.7.1	<i>EucDist</i>	241
11.7.2	Use of a Feature Layer as the Source in <i>EucDist</i>	242
Box 11.6	EucDist_GP	243
11.7.3	<i>Slice</i>	243
11.7.4	<i>CostDist</i>	245
11.7.5	<i>CostDistFull</i>	246
Chapter 12	Terrain Mapping and Analysis	249
12.1	Performing Terrain Mapping and Analysis in ArcGIS	250
12.2	ArcObjects for Terrain Mapping and Analysis	250
12.3	Deriving Contour, Slope, Aspect, and Hillshade	252
12.3.1	<i>Contour</i>	252
Box 12.1	Contour_GP.....	253
12.3.2	<i>Slope</i>	254
Box 12.2	Slope_GP.....	255
12.3.3	Choice of Slope Measure	255
12.3.4	<i>ReclassifySlope</i>	256
12.3.5	Aspect.....	257
12.3.6	<i>Aspect_Symbol</i>	258
Box 12.3	Aspect_GP	260
12.3.7	Hillshade.....	262

12.4 Performing Viewshed Analysis 262

 12.4.1 *Visibility* 263

12.5 Performing Watershed Analysis 264

 12.5.1 *Watershed* 265

12.6 Creating and Editing TIN 268

 12.6.1 *RasterToTin* 268

 Box 12.4 *RasterToTin_GP* 270

 12.6.2 *EditTin* 271

 12.6.3 *TinNodes* 272

Chapter 13 Spatial Interpolation 275

13.1 Running Spatial Interpolation in ArcGIS 276

13.2 ArcObjects for Spatial Interpolation 276

13.3 Performing Spatial Interpolations 277

 13.3.1 *Idw* 277

 Box 13.1 *Idw_GP* 279

 13.3.2 *Spline* 279

 13.3.3 *Trend Surface* 280

 13.3.4 *Kriging* 280

 Box 13.2 *Kriging_GP* 282

13.4 Comparing Interpolation Methods 283

 13.4.1 *Compare* 283

Chapter 14 Binary and Index Models 287

14.1 Building Models in ArcGIS 288

14.2 ArcObjects for GIS Models 288

14.3 Building Binary and Index Models 288

 14.3.1 *VectorBinaryModel* 288

 Box 14.1 *VectorBinaryModel_GP* 293

 14.3.2 *VectorIndexModel* 293

 Box 14.2 *VectorIndexModel_GP* 299

 14.3.3 *RasterBinaryModel* 300

 Box 14.3 *RasterBinaryModel_GP* 304

 14.3.4 *RasterIndexModel* 304

 Box 14.4 *RasterIndexModel_GP* 309

Index 311